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Observations. Date

Instrument Power

Border

Floor

No. 1.
,, 3.
,, 4.
,, 5.
,, 6.
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*,, 19.
*,, 22.

* These spots should be particularly sought for.

Remarks

Observer

Lunar Occultations and Eclipses of Jupiter's Satellites.

By John Tebbutt, Esq.

I herewith send a list of lunar occultations and eclipses of *Jupiter's* satellites observed by me at Windsor. The first-mentioned phenomena were not previously computed, so that I was unable, except in two or three instances, to observe the reappearances. A few only of the stars are to be found in the Occultation-List of the *Nautical Almanac*, or in the Catalogues in my possession; but the magnitude of each star and its roughly estimated position, when in contact with the Moon's limb, are given in order to facilitate its future identification. With the exception of the observation of May 18, 1864, all the occultations were observed with my 4-feet refractor and a power of 30. The eclipses of *Jupiter's* satellites were observed with the same telescope, but with a power of 120. The chronometer on the 12th April and 18th May, 1864, was regulated from sextant observations, but on all other occasions with the transit-instrument. It is hoped that the list of occultations may hereafter prove useful for the accurate determination of the longitude of the Observatory, and hence serve for a verification of that of the Sydney Observatory. In conclusion, I may state that the latitude of my Observatory, as finally deduced from a large number of prime vertical observations of stars whose positions have been accurately determined in southern observatories, is $-33^{\circ}\,36'\,29''{\cdot}2$.

Paramatta, N.S. Wales, Sept. 26th, 1871.

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Occultations, 1864–70.

Date of Obs.	Mag. of Stars.	Disappearance or Reappearance.	Windsor Mean Time. h m s	Angle from Moon's N. Cusp. °	Remarks.
1864.					
April 12	4½	D	8 46 11·6	80 E	Excellent observation. Disappearance sudden.
May 18	1	D	13 39 16·5	—	Disappearance instantaneous. Obs. made with telescope of 1⅝-in. aperture.
1866.					
April 18	6½	D	6 14 36·2	70 E	Obs. uncertain to 1^{s}, star being faint.
May 17	6½	D	7 2 12·2	80 E	Star appeared to encroach slightly on disk before extinction.
19	7½	D	6 22 52·8	120 E	Star very faint at disappearance.
19	6½	D	6 52 49·8	40 E	Star distinct, but telescope tremulous.
19	8	D	8 48 39·8	70 E	Star distinct.
22	6½	D	8 13 50·2	75 E	Good observation.
Sept. 24	7	D	11 31 7·7	—	Extinction remarkably sudden, being observed near N. limb during total eclipse.
Oct. 15	6½	D	7 21 22·3	100 E	Disappearance instantaneous.
1867.					
May 9	6½	D	6 31 38·4	90 E	Disappearance not quite instantaneous.
Oct. 1	6½	D	7 27 51·4	90 E	Star rather faint.
1868.					
Feb. 27	5½	D	7 48 46·9	80 E	Good observation.
March 2	5	D	10 11 27·2	30 E	Good observation. Disappearance gradual.
May 26	7	D	7 37 36·1	150 E	
26	8	D	7 48 57·6	135 E	Star rather faint.
26	8	D	7 53 31·6	60 E	Star rendered faint by cloud.
27	5	D	7 35 1·6	135 E	Moon's limb exceedingly distinct and well defined.
27	7	D	7 42 13·9	110 E	
27	7½	D	7 45 32·9	90 E	
27	7½	D	7 57 54·9	135 E	
29	7	D	7 0 0·7	90 E	Observation uncertain owing to faintness of star on limb.
June 1	6	D	6 35 14·4	30 E	Disappearance rather gradual.
1	6	D	7 24 44·4	130 E	Ditto more sudden.
Aug. 24	7	D	6 49 54·8	100 E	Good observation.
24	7	D	7 20 56·1	85 E	Good observation.
27	7	D	6 38 43·4	90 E	Star faint at disappearance.
27	6½	D	6 46 14·0	70 E	
27	6½	D	7 25 8·8	60 E	Disappearance uncertain to 1^{s}.
27	6½	D	7 36 19·8	115 E	Disappearance gradual.
27	6¼	D	7 52 29·3	120 E	Disappearance sudden.
27	7	D	7 56 20·0	120 E	Disappearance rather sudden.
27	6	D	8 22 19·3	25 E	Disappearance uncertain owing to thin cloud.
28	5½	D	8 1 37·7	70 E	Star probably disappeared about a quarter of a second earlier than time noted.
28	6	D	9 26 52·6	90 E	Obs. 4 or 5 seconds late owing to temporary removal of eye from telescope.
28	6	D	9 40 16·0	160 E	Disappearance gradual and star faint.
Sept. 22	6½	D	7 21 34·1	60 E	Good obs.; disappearance sudden.
26	6	D	8 3 41·2	90 E	Disappearance gradual.

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Date of Obs.	Mag. of Stars.	Disappearance or Reappearance.	Windsor Mean Time.	Angle from Moon's N. Cusp.	Remarks.
1868.			h m s	°	
Oct. 22	7	D	6 54 50·7	135 E	Star clung to limb for some time.
22	7	D	7 9 33·9	130 E	Disappearance rather gradual.
22	6	D	8 12 7·5	150 E	Ditto.
22	5½	D	8 13 22·0	65 E	Ditto.
22	5½	D	8 27 18·9	75 E	Disappearance pretty sudden.
27	6½	D	9 39 49·0	140 E	Star faint; disappearance rather gradual.
1869.					
Jan. 20	7	D	8 30 56·6	90 E	Star rather faint at disappearance.
Feb. 17	4	D	8 3 32·6	80 E	Disappearance sudden; very good obs.
24	4	D	8 0 49·3	55 E	Good observation; disappearance sudden.
Mar. 22	5	D	10 2 5·0	70 E	Very good observation; disappearance very sudden.
Apr. 19	5	D	8 10 59·5	70 E	
19	6	D	8 55 56·4	70 E	
Nov. 9	5½	D	9 6 52·0	80 E	Disappearance sudden, but followed by a faint flash of light.
Nov. 9	6½	D	9 46 45·8	135 E	Star faint, but disappearance sudden.
Dec. 6	7	D	7 43 56·1	25 E	Star faint; disappearance gradual.
6	7	D	8 2 12·0	65 E	Star rather faint; disappearance sudden.
6	7	D	8 46 20·4	110 E	Star faint; disappearance uncertain to a second.
10	6½	D	8 37 45·4	70 E	Disappearance not quite instantaneous.
1870.					
Jan. 17	7	D	11 59 24·7	—	Disappearance instantaneous.
17	–	D	12 49½	—	Faint star.
17	8	D	13 2 19·3	—	Star faint; time somewhat uncertain.
17	8	D	13 5 0·2	—	Ditto.
17	8	R	13 6 18·7	—	
17	7	R	13 25 4·2	—	Recorded time rather late.
17	7	D	13 36 24·2	—	Time uncertain to a second. All the occultations were observed during total eclipse.
Feb. 8	5	D	9 9 36·3	60 E	Disappearance sudden; observation very exact.
11	3½	D	8 18 1·5	75 E	Disappearance instantaneous.
May 7	7½	D	6 1 58·3	70 E	Disappearance rather sudden.
June 3	5	D	7 19 52·0	70 E	Excellent observation; disappearance instantaneous.
9	6½	D	6 43 38·4	25 E	Good obs.; disappearance rather gradual.
July 4	8	D	6 22 51·9	160 E	Star faint; disappearance gradual. Time uncertain to half a second.
Oct. 1	7½	D	7 40 14·1	110 E	Star faint at disappearance.
1	7	D	7 42 23·6	100 E	Ditto.
1	5	D	7 58 18·0	15 E	Disappearance instantaneous. Faint at reappearance and time probably 2 or 3 seconds late.
1		R	8 11 35·5	—	
28	6½	D	8 46 58·8	135 E	Disappearance instantaneous.
29	6	D	7 19 45·3	145 E	Good observations, and disappearances instantaneous.
29	6	D	8 52 45·4	140 E	
Nov. 28	7	D	8 36 51·7	40 E	Star rather faint at disappearance.
30	4	D	10 7 52·2	80 E	Observation uncertain owing to a passing cloud.

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Eclipses of Jupiter's Satellites, 1868–70.

Date of Obs.	Satellite.	Disappearance or Reappearance.	Windsor Mean Time.			Remarks.
			h	m	s	
1868.						
Aug. 25	II	D	11	17	28·8	Images steady and well defined. Moon present.
Oct. 22	I	R	8	44	16·5	Images tremulous and ill defined.
Nov. 7	I	R	7	4	33·1	Images rather tremulous; twilight had scarcely disappeared.
Dec. 10	III	D	9	39	2·4	Definition pretty good; sky rather hazy. Disappearance very gradual.
17	II	R	7	12	36·5	Strong twilight. Sun's upper limb disappeared on horizon 10 minutes previously. Images tremulous, but pretty well defined.
1869.						
Jan. 25	II	R	9	32	54·0	Planet only about 5° above horizon; images unsteady and ill defined.
Nov. 26	I	R	8	48	34·4	Images well defined; recorded time somewhat late.
1870.						
Jan. 1	III	D	11	8	42·1	Planet very ill defined and boiling.
Feb. 3	I	R	9	38	0·3	Limb boiling.
Dec. 6	I	D	11	56	41·2	Excellent observation.

Reply to the Notes and Queries made by the Astronomer Royal, on the "Observations of η Argûs and its Nebula," Monthly Notices R. A. S. for June 9, 1871, pages 233 and 234. By F. Abbott, Esq.

Note No. 1.—"See in particular the line of four stars convex towards *η Argûs*."

These stars have retained their apparent positions, &c. more than any others in the same object, although variations to a small extent have taken place. In carefully looking over the drawings it will be found that a similarity exists in the position of many of the stars, but as a rule some changes have taken place.

In regard to the use of geometry, it was never my intention to apply it, but only to sketch the object as an eye-draft; and by adopting the term "line of sight," it was intended to simplify, by always observing the object in one position, *i.e.* the telescope lying in a direct line W.N.W. to E.S.E. (the drawing being reversed) and at an angle of from 70° to 80° above the horizon, according to the state of the atmosphere at the time. *In this line of sight* all the drawings have been made; and in an easy, sitting position, with the light shaded from everything but the paper, the object has always been carefully delineated.

With regard to "all the stars agreeing with either Sir John, or Lieut. A. Herschel's configurations," I never expected they

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would, as apparent changes have more or less constantly been taking place.

The question asked in No. 7—"The drawing (Lieut. Herschel's) had undoubtedly reached Australia, has Mr. Abbott copied it?"—I answer, No!—The whole of my drawings were made previous to, and independent of, any others.

In making comparison, it would be desirable to refer to the original drawings, as in the lithographs, which are on a reduced scale, some trifling inaccuracies occur.

Private Observatory, Hobart Town,
5th October, 1871.

I have forwarded by the same mail lithographic copies of the drawings, made by order of the Government, and published in the *Proceedings of the Royal Society of Tasmania.*

Note on Mr. Abbott's imagined Discovery of great Changes in the Argo Nebula. By R. A. Proctor, B.A.

I have received a letter and several papers from Mr. Abbott on the subject of the Nebula in *Argo;* and he appears to desire that I should express an opinion as to the reality of the supposed changes in the Nebula. I have, therefore, re-examined his papers and pictures, to which I had given a careful scrutiny two or three years ago. I had then been quite perplexed by the arrangement of the stars as compared with the Cape Monograph. But now, after reading Capt. Herschel's Note on the subject in the last Supplementary Number of the *Monthly Notices,* I find not the least difficulty in interpreting Mr. Abbott's pictures. Unquestionably Capt. Herschel is right. Mr. Abbott has supposed the dark spaces (shown in Sir J. Herschel's Monograph) to correspond to the lemniscate, which would unquestionably imply a complete change in the whole aspect of the Nebula. On the scale of Mr. Abbott's drawings the lemniscate would be about 2-5ths of an inch long; it would, in fact, be a minute and scarcely discernible feature. Mr. Abbott's field of view has a diameter exceeding the length of the rectangular space included in Sir J. Herschel's Monograph. The case is precisely as though an observer with a small telescope, using a power so low as to give a field 1° 8′ in diameter, were to regard the appearance of the Nebula so seen as a view of the region immediately surrounding the trapezium. It is most unfortunate that by this mistake Mr. Abbott has caused so much valuable time to be wasted by Sir J. Herschel, the Astronomer Royal, Mr. Lassell, and others.